RECO Interests/Experience

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Reconstruction Interests/Experience 1

- I develop ParticleFlow reconstruction at CMS
  - A small team, ~2-3 core developers at present
  - Some general info on PF: https://goo.gl/5df1q4
  - For LHC Run 2 and High Luminosity LHC (HL-LHC)
    - I wrote the electron/photon reconstruction for Run 2
    - Serious computing demands for HL-LHC
- Worked with Pandora since CMS expects to use a high-granularity silicon sampling calorimeter
  - Very familiar with its strengths and limitations
  - It is a great tool for organizing your thoughts into a functioning reconstruction
  - However, lots of replication of information and not very memory efficient (baked into internal pandora event model)
  - Improved linear collider clustering/particle flow algorithmic efficiency by 400%-600% (CLIC vs. HL-LHC)
    - Application of computational geometry + graph theory, baseline algorithms took 1-2 hours per individual HL-LHC event (definitely not going in a trigger) upgraded algos function in decent time (still need to push harder!)
  - Next step is to develop an HL-LHC appropriate reconstruction stack in terms of computing budget, and explore use of GPUs for triggering
- Application of fast timing detectors to the HL-LHC towards having "lorentz covariant" event reconstruction
  - Timing resolutions of 30ps or better allow 140-200PU bunch crossings to be decomposed into frames of less pileup (easily reduce by a factor of 4)

Reconstruction Interests/Experience 2

- Very interested in figuring out a common reconstruction framework like Pandora that accommodates more demanding detector environments as well
  - Also, other computing architectures: GPUs, PHI
  - This could be to the benefit of every experiment at FNAL
    - To me, having the ideas in a common 'language', as was a core idea of Pandora or IArSoft, is a **huge** improvement over the disjoint software packages of the past
  - Possibly work with Pandora authors to improve what is already there?